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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/665,298	09/17/2003	Michael C. Green	005513P018	5448

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Daniel E. Ovanezian
BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP
Seventh Floor
12400 Wilshire Boulevard
Los Angeles, CA 90025-1026

EXAMINER	
LE, THAO X	

ART UNIT	PAPER NUMBER
2814	

DATE MAILED: 05/23/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/665,298	GREEN ET AL.	
	Examiner	Art Unit	
	Thao X. Le	2814	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *11 April 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-37* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-37* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1-2, 5, 16, and 27-29 are rejected under 35 U.S.C. 102(b) as being anticipated by US 6403965 to Ikeda et al.

Regarding claim 1, Ikeda discloses a photodetector in fig. 2, comprising: a plurality of semiconductor materials 208-211, col. 6 line 63-67, forming a heterojunction, the plurality of semiconductor materials comprising: a first semiconductor material 209, col. 7 line 3; a second semiconductor material 210, col. 7 line 10, coupled to the first semiconductor material 209, the first and second semiconductor materials being halides (n-type or P-type Se is being doped with halogen, Cl or I to, increase or decrease the resistivity), col. 7 lines 15-18, wherein at least one of the first and second semiconductor materials consists of a semiconductor material (N-type or P-type Se).

Regarding claim 2, Ikeda discloses the photodetector wherein the first and second semiconductor materials have approximately the same band gap (similar material)

Regarding claim 5, Ikeda discloses the photodetector further comprising: a first contact 103, col. 6 line 61; and a second contact 212, col. 7 line 8, wherein the first

plurality of semiconductor materials 208-2111 are disposed between the first and second contacts 103/212, fig. 2.

Regarding claim 16, Ikeda discloses the photoconductor wherein the second semiconductor material 210 has a conductivity type different than the first semiconductor material (N-Se or P-Se), col. 7 line 14 and line 17.

Regarding claims 27-29, Ikeda discloses the photodetector is coupled to a negative bias, wherein the first contact is coupled to ground and the second contact is coupled to a negative voltage, fig. 8 or 9.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

5. Claims 3-4, 7-15, 17-20, 30-36 are rejected under 35 U.S.C. 103(a) as being unpatentable over 6403965 to Ikeda et al.

Regarding claims 3-4, 18, 34-36, Ikeda does not expressly disclose the photodetector wherein the first semiconductor comprises a lead iodide compound and the second semiconductor material comprises mercuric iodide.

However, Ikeda discloses the X-ray converting material may be formed of a-Se, alloy se and Te or As, a-Si, A-Te, PbI_2, or HgI_2, col. 12 lines 24-26. At the time of the invention was made; it would have been obvious to one of ordinary skill in the art to use the X-Ray converting material teaching of Ikeda as claimed, because such material substitution would have been considered a mere substitution of art-recognized equivalent values, MPEP 2144.06. Furthermore, PbI_2, or HgI_2 would be suitable for low dark current and negative biased photoconductor for direct x-ray conversion, see Polischuk (6353229) in col. 5 lines 12-20.

Regarding claims 7, Ikeda does not disclose the photoconductor wherein the second semiconductor material comprises mercuric iodide and the first semiconductor material is less chemically reactive than mercuric iodide with the contacts.

However, Ikeda discloses the X-ray converting material may be formed of a-Se, alloy se and Te or As, a-Si, A-Te, PbI_2, or HgI_2, col. 12 lines 24-26. At the time of the invention was made; it would have been obvious to one of ordinary skill in the art to use the X-Ray converting material teaching of Ikeda as claimed, because such material substitution would have been considered a mere substitution of art-recognized equivalent values, MPEP 2144.06. Furthermore,

PbI_2, or HgI_2 would be suitable for low dark current and negative biased photoconductor for direct x-ray conversion, see Polischuk (6353229) in col. 5 lines 12-20.

Regarding claims 8-13, 19, Ikeda discloses the photodetector wherein the first semiconductor material 209 has a thickness about 200 μm or less than 50μm, col. 6 line 67, wherein the second semiconductor 210 is thicker than the first semiconductor material 209, col. 7 line 6.

Regarding claim 14, Ikeda discloses the photoconductor wherein the plurality of semiconductor material further comprises a third semiconductor 211, col. 7 line 5, coupled to the second semiconductor material 210, fig. 2.

But Ikeda does not disclose expressly the third semiconductor comprises lead iodide.

However, Ikeda discloses the X-ray converting material may be formed of a-Se, alloy se and Te or As, a-Si, A-Te, PbI_2, or HgI_2, col. 12 lines 24-26. At the time of the invention was made; it would have been obvious to one of ordinary skill in the art to use the X-Ray converting material teaching of Ikeda as claimed, because such material substitution would have been considered a mere substitution of art-recognized equivalent values, MPEP 2144.06. Furthermore, PbI_2, or HgI_2 would be suitable for low dark current and negative biased photoconductor for direct x-ray conversion, see Polischuk (6353229) in col. 5 lines 12-20.

Regarding claims 15, 20, Ikeda discloses the photodetector wherein the third semiconductor material 211 has a thickness about less than 50μm, col. 7 line 6.

Regarding claim 17, Ikeda discloses the photodetector wherein the second semiconductor material has a conductivity type different than the first semiconductor material, page 31 line 8, wherein the band gap of the first and second semiconductor material are within 10 percent of each other. Although the prior art does not specially disclose the claimed band gap, this feature is seen to be inherent or obvious teaching of that limitation because of the material properties.

Regarding claim 30, Ikeda discloses a photodetector in fig. 2, comprising: a first semiconductor material 209; a second semiconductor material 210 coupled to the first semiconductor material 209 forming a heterojunction structure; wherein at least one of the first and the second semiconductor materials consists of a semiconductor material, a contact 211 coupled to the second semiconductor material 210, wherein the first and second semiconductor materials comprise means for reducing a chemical reaction with the contact; and means for reducing dark current in the heterojunction structure.

But Ikea does not expressly disclose the photoconductor comprises means for reducing a chemical reaction with the contact; and means for reducing dark current in the heterojunction structure.

However, Ikeda discloses the X-ray converting material may be formed of a-Se, alloy se and Te or As, a-Si, A-Te, PbI_2, or HgI_2, col. 12 lines 24-26. At the time of the invention was made; it would have been obvious to one of ordinary skill in the art to use the X-Ray converting material teaching of Ikeda as claimed,

because such material substitution would have been considered a mere substitution of art-recognized equivalent values, MPEP 2144.06. Furthermore, PbI_2, or HgI_2 would be suitable for low dark current and negative biased photoconductor for direct x-ray conversion, see Polischuk (6353229) in col. 5 lines 12-20. In addition, Ikeda discloses the structure and materials substantially identical to that of the claims, claimed properties or functions are presumed to be inherent. *In re Best*, 195 USPQ 430, 433 (CCPA 1977).

Regarding claim 31, Ikeda discloses a photodetector in fig. 2, comprising: a first semiconductor material 209; and a second semiconductor material 210 coupled to the first semiconductor material 209; wherein at least one of the first and the second semiconductor materials consists of a semiconductor material; a contact 211 coupled to the second semiconductor material 210

But Ikeda does not disclose the second semiconductor material is less corrosive than the first semiconductor material to the contact.

However, Ikeda discloses the X-ray converting material may be formed of a-Se, alloy se and Te or As, a-Si, A-Te, PbI_2, or HgI_2, col. 12 lines 24-26. At the time of the invention was made; it would have been obvious to one of ordinary skill in the art to use the X-Ray converting material teaching of Ikeda as claimed, because such material substitution would have been considered a mere substitution of art-recognized equivalent values, MPEP 2144.06. In addition, Ikeda discloses the structure and materials substantially identical to that of the

claims, claimed properties or functions are presumed to be inherent. *In re Best*, 195 USPQ 430, 433 (CCPA 1977).

Regarding claims 32-33, Ikeda discloses the photoconductor wherein the first and second semiconductor materials are halides or iodide, col. 7 lines 15-17.

6. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over 6403965 to Ikeda et al. in view of US 6353229 to Polischuk et al. or WO 02/067014 to Harel.

Regarding claim 6, Ikeda discloses the photodetector wherein at least one of the first and second contacts comprise ITO or aluminum, col. 6 line 61.

But Ikeda does not disclose the photodetector wherein at least one of the first and second contacts comprise palladium.

However, Harel discloses the photodetector electrode consisting of ITO or palladium, see claim 18 and 19; and Polischuk discloses the photodetector electrode consisting of palladium, ITO, or aluminum, col. 5 lines 54-57. At the time of the invention was made; it would have been obvious to one of ordinary skill in the art to use the electrode teaching of Harel or Polischuk to replace the aluminum electrode of Ikeda, because such material substitution would have been considered a mere substitution of art-recognized equivalent values, MPEP 2144.06.

7. Claim 21-26, 37 are rejected under 35 U.S.C. 103(a) as being unpatentable over 6403965 to Ikeda et al. in view of US 6949750 to Tsutsui et al.

Regarding claims 21-26, 37, Ikeda discloses the photodetector wherein at least one of the first and second semiconductor materials comprises iodide compound, col. 1 line 16.

But Ikeda does not disclose the first semiconductor material comprises bismuth iodide or thallium bromide.

However, Tsusui discloses a photo conversion layer 4 can include various materials such as bismuth iodide, thallium bromide, lead iodide, or mercury iodide, col. 6 lines 17-30. At the time of the invention was made; it would have been obvious to one of ordinary skill in the art to use the photo conversion material teaching of Tsutsui to replace the photo conversion material electrode of Ikeda, because such material substitution would have been considered a mere substitution of art-recognized equivalent values, MPEP 2144.06.

With respect to "the second semiconductor comprises mercuric iodide wherein the first semiconductor layer comprises lead iodide" see discussion the above claims 3-4.

Response to Arguments

8. Applicant's arguments with respect to claims 1-37 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

9. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thao X. Le whose telephone number is (571) 272-1708. The examiner can normally be reached on M-F from 8:00 AM - 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael M. Fahmy can be reached on (571) 272 -1705. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for

published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Thao X. Le
19 May 2006